"The Spectra of Neon, Krypton, and Xenon." By E. C. C. Baly, Lecturer on Spectroscopy in University College, London. Communicated by Sir William Ramsay, K.C.B., F.R.S. Received June 12,—Read June 18, 1903.

(Abstract.)

The gases were illuminated by the passage of the discharge from an induction coil through them under reduced pressures. Vacuum tubes were filled with each one of them, and the glowing gas in a capillary portion was examined "end on" through a quartz window. Considerable difficulty was experienced in the use of the vacuum tubes, owing to the rapid absorption of the gas by the electrodes when the electric current was kept passing for long periods. It was found that when the gases were quite pure, and free from any diatomic impurities, the aluminium electrodes were readily volatilised, an aluminium mirror being formed upon the immediately surrounding walls of the tube; at the same time the electrodes became very hot and it was necessary to make them of very stout wire, *e.g.*, No. 12 B.W.G. Special care had to be taken in making each individual electrode so as to enable it to withstand the disintegrating action of the discharge. The unusual heating of the electrodes gave rise to considerable trouble on account of the large quantities of hydrogen evolved from them; it is a common experience to anyone, when filling a new vacuum tube, to find a quantity of hydrogen given out by the electrodes; this hydrogen, as is well known, may be readily removed by further exhaustion. If, however, into a tube from which this hydrogen has been removed a small quantity of one of the monatomic gases be introduced, a further large quantity of hydrogen is evolved from the electrodes. Every trace of this second quantity of hydrogen must be removed before the tube can be depended upon; it is necessary to thoroughly wash out the tube by repeated admission of argon and re-exhaustion.

The measurements were all made upon photographs taken with a Rowland concave grating of 10-foot radius and 14,438 lines to the inch; the first three orders of spectra were employed and nearly all the chief lines were measured in two orders. As far as can be estimated by the coincidences between the different spectra, the probable error is less than $\pm 0{\cdot}03$ Ångström unit. The spectra are all composed of bright lines and are absolutely characteristic in each case. While neon possesses only one spectrum, krypton and xenon both have two, one being given when the ordinary discharge is passed and the other when a Leyden jar and spark gap are placed in the circuit; this second spectrum is much more

complex than the first in each case, an analogy being thus shown with argon.

There are about forty lines of weak intensity common to the jar and spark gap spectra of krypton and xenon; this may possibly be considered as evidence of the existence of another element of higher atomic weight in the same series.

In the tables of the spectra, columns are given of the measurements which have appeared by Liveing and Dewar and by Runge in the case of krypton. A very satisfactory agreement is to be observed between the two series of measurements, although those of Liveing and Dewar are only given to the fourth place. It is interesting that these authors give, in their list of the spectrum lines of the most volatile gases of the atmosphere, about 162 lines which do not appear on the neon photographs, and, therefore, in all probability, do not belong to this gas.

The most important lines in the visible region of the spectrum are given in the following tables:—

Neon Spectrum.

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
6402·40	10	6096·37	10
6383·15	8	6074·52	10
6328·38	6	6030·20	10
6304·99	8	5975·78	8
6266·66	10	5974·73	6
6217·50	8	5944·91	10
6182·37	10	5882·04	8
6163·79	10	5852·65	20
6143·28	10	5764·54	8
6128·63	8	4259·53	6

The First Krypton Spectrum.

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
5871·12	10	4454·12	10
5570·50*	10	4400·11	6
5562·45	6	4376·33	10
4671·40	10	4362·83	9
4624·48	10	4319·76	10
4502·56	9	4318·74	8
4501·13	7	4274·15	10
4463·88	10		

* Probably the green Aurora line.

The Second Krypton Spectrum.

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
5633·17	6	4109·38	6
4765·90	6	4098·89	7
4762·60	5	4088·48	8
4739·16	7	4067·53	5
4659·04	5	4065·22	8
4634·05	5	4057·17	8
4619·31	6	4050·62	5
4615·46	5	4044·80	5
4577·40	6	3998·10	5
4523·32	5	3994·98	6
4475·18	7	3954·90	5
4355·67	10	3920·29	8
4317·98	5	3917·76	6
4300·67	5	3912·69	5
4293·10	6	3906·37	8
4145·28	6		

The First Xenon Spectrum.

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
4923·28	6	4524·83	6
4916·63	6	4501·13	10
4807·19	6	4193·70	8
4734·30	8	4116·25	7
4697·17	7	4109·84	5
4671·42	10	4078·94	10
4624·46	15	3967·74	10
4582·89	5	3951·16	10

The Second Xenon Spectrum.

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
6097·80	7	5460·63	6
6051·36	7	5450·71	5
6036·40	6	5439·19	8
5976·67	7	5419·40	10
5751·28	5	5372·62	8
5727·15	5	5339·56	9
5719·83	6	5314·15	8
5667·85	6	5292·40	10
5659·67	5	5262·16	5
5616·99	6	5260·65	5
5531·33	7	5191·60	5
5472·90	7	5080·88	7

Wave-lengths.	Intensity.	Wave-lengths.	Intensity.
4921·68	6	4415·00	7
4890·24	5	4406·99	5
4887·47	5	4395·91	10
4883·68	6	4393·34	10
4876·68	7	4330·63	15
4862·69	8	4296·52	5
4844·50	10	4245·54	10
4823·47	6	4238·37	10
4698·20	5	4223·14	5
4683·76	5	4215·77	5
4652·15	6	4214·17	5
4615·72	5	4213·80	5
4603·21	10	4208·61	6
4592·22	6	4193·25	8
4585·65	10	4180·20	10
4577·36	6	4158·14	5
4545·34	8	4145·85	5
4541·03	8	4109·20	6
4532·67	5	4057·55	5
4524·38	5	4050·19	6
4481·01	7	3992·98	5
4462·38	20	3950·70	8
4448·28	10	3922·67	10
4434·35	6	3908·00	7

The total numbers of lines measured in the five spectra are as follows:—

Neon	164 lines.
Krypton I	74 „
Krypton II	700 „
Xenon I	92 „
Xenon II	1370 „

There are, 17 lines which are common to the two Krypton Spectra, and 7 common to those of Xenon.